Volume 28.1 Fall 2023

# Patent Points 2



NOW STARTING MY 30 TH YEAR...

### Start-Ups With **Patents 6x More** Likely to Obtain Financing

Since the 1990's we have been saving that patents help start-up companies obtain VC financing. Now a study out of the EU has confirmed this.

A joint study by the European Patent Office (EPO) and the European Union Intellectual Property Office (EUIPO) found that startups applying for patents and/or trade marks during their initial seed or early growth stages were up to 10.2 times more likely to secure funding. Having the company's patent application granted and issued as a patent increased the odds of funding by another 5x.

Patents increased funding odds by a factor of 6.4, while trademarks increased funding odds by a lower factor of 4.3 for early stage companies. Applying for both patents and trademarks increased funding odds by 10.2x.

Outside of biotech startups, of which almost 50% applied for patents, less than 25% of startups applied for patents. Only about 7% of software

startups had applied for patents while 25% of science and engineering startup had applied for patents.

### **VC Investors Also** Win With Patents!

The study also had good news for VC's and other investors providing the funding. The study found that filing a patent or trademark application doubled the likelihood of a successful exit for the investors.

One caveat is that this study only looked at start-ups in Europe. Start-ups in the US or other countries may receive funding from sources with different requirements than in Europe.

The full study can be found at:

https://www.epo.org/en/servicesupport/publications?pubid=943333

### **INSIDE**

- 2 Skew-Adjusted ADC Patent
- 3 Limited-Energy BMS
- 589 Patents Issued



US011646747B1

# (12) United States Patent Lok

# (54) MULTI-CHANNEL INTERLEAVED ANALOG-TO-DIGITAL CONVERTER (ADC) USING OVERLAPPING MULTI-PHASE CLOCKS WITH SAR-SEARCHED INPUT-CLOCK DELAY ADJUSTMENTS AND BACKGROUND OFFSET AND GAIN CORRECTION

(71) Applicant: Caelus Technologies Limited, Hong

Kong (HK)

(72) Inventor: Chi Fung Lok, Hong Kong (HK)

(73) Assignee: Caelus Technologies Limited, Hong

Kong (HK)

(\*) Notice: Subject to any disclaimer, the term of this

patent is extended or adjusted under 35

U.S.C. 154(b) by 0 days.

(21) Appl. No.: 17/580,805

(22) Filed: Jan. 21, 2022

#### Related U.S. Application Data

- (63) Continuation-in-part of application No. 17/537,460, filed on Nov. 29, 2021, and a continuation-in-part of application No. 17/455,471, filed on Nov. 18, 2021.
- (51) Int. Cl. *H03M 1/10* (2006.01) *H03M 1/12* (2006.01)

(Continued)

(52) **U.S. Cl.** CPC ....... *H03M 1/1057* (2013.01); *H03M 1/1215* (2013.01); *H03M 1/0624* (2013.01); (Continued)

(58) Field of Classification Search

CPC .... H03M 1/1014; H03M 1/1033; H03M 1/12; H03M 1/38; H03M 1/0624; H03M 1/1023

See application file for complete search history.

### (--) = ----

(45) Date of Patent:

(10) Patent No.:

(56)

May 9, 2023

US 11,646,747 B1

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7,312,734 B2 12/2007 McNeill et al. 7,404,162 B2 7/2008 Matsuo et al. (Continued)

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Ru Yi et al., "Digital Compensation for Timing Mismatch in Interleaved ADCs", 2013 Asian Test Sym., Proc. IEEE, Nov. 18, 2013, pp. 134-139.

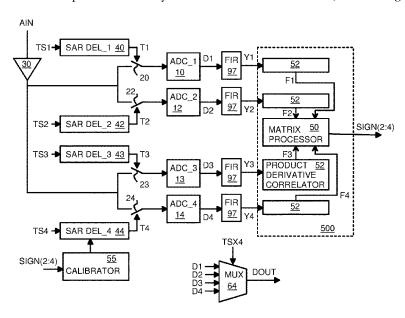
(Continued)

Primary Examiner — Joseph J Lauture (74) Attorney, Agent, or Firm — G Patent LLC; Stuart T Auvinen

### (57) ABSTRACT

An N-channel interleaved Analog-to-Digital Converter (ADC) has a variable delay added to each ADC's input sampling clock. The variable delays are each programmed by a Successive-Approximation-Register (SAR) during calibration to minimize timing skews between channels. Each channel receives a sampling clock with a different phase delay. The sampling clocks are overlapping multi-phase clocks rather than non-overlapping. Overlapping the multiphase clocks allows the sampling pulse width to be enlarged, providing more time for the sampling switch to remain open and allow analog voltages to equalize through the sampling switch. Higher sampling-clock frequencies are possible than when non-overlapping clocks are used. The sampling clock is boosted in voltage by a bootstrap driver to increase the gate voltage on the sampling switch, reducing the ON resistance. Sampling clock and component timing skews are reduced to one LSB among all N channels.

### 20 Claims, 15 Drawing Sheets





US011644513B1

## (12) United States Patent Ding et al.

# (54) REAL-TIME AC-IMPEDANCE INSPECTION USING LIMITED-ENERGY ON-BOARD AC EXCITATION FOR BATTERY MANAGEMENT SYSTEM

(71) Applicant: Hong Kong Applied Science and Technology Research Institute
Company Limited, Hong Kong (HK)

(72) Inventors: **Wenlong Ding**, Hong Kong (HK); **Meng Chen**, Hong Kong (HK);

Yaofeng Sun, Hong Kong (HK); Manxin Chen, Hong Kong (HK)

(73) Assignee: Hong Kong Applied Science and Technology Research Institute Company Limited, Hong Kong (HK)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35

U.S.C. 154(b) by 0 days.

(21) Appl. No.: 17/570,527

(22) Filed: Jan. 7, 2022

(51) Int. Cl. *G01R 31/389* (2019.01) *H02J 7/00* (2006.01)

(Continued)

(52) U.S. Cl.
CPC ........... G01R 31/389 (2019.01); G01R 31/367
(2019.01); G01R 31/392 (2019.01); H02J
7/005 (2020.01); H02J 7/0068 (2013.01);
H02J 7/00711 (2020.01); H02J 7/345
(2013.01); H02M 3/04 (2013.01)

(58) Field of Classification Search

See application file for complete search history.

### (10) Patent No.: US 11,644,513 B1

(45) **Date of Patent:** May 9, 2023

#### (56) References Cited

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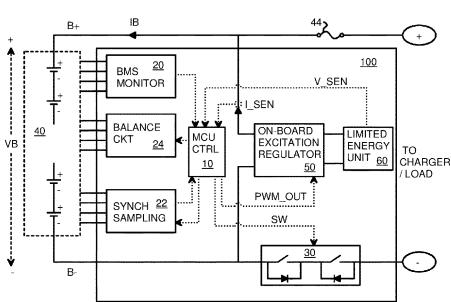
ISR and Written Opinion, PCT/CN2022/082519, dated Sep. 21, 2022.

Primary Examiner — Jas A Sanghera (74) Attorney, Agent, or Firm — gPatent LLC; Stuart T. Auvinen

### (57) ABSTRACT

A Battery Management System (BMS) inspects a battery pack using AC impedance. A controller on the BMS drives a Pulse-Width Modulation (PWM) output signal to an onboard excitation regulator such as a synchronous buck converter that modulates a limited energy unit such as a capacitor with a swept frequency of a PWM input signal. The capacitor modulations are applied to a terminal of the battery pack as an AC excitation signal. Synchronous sampling of the battery pack provides responses to the AC excitation signal. An AC excitation signal current and a battery response voltage are processed and Fourier-transformed to generate a Nyquist plot of the excitation-response data. Curve shifts can indicate worn battery cells. The capacitor generating the AC excitation signal draws little energy from the battery pack so AC impedance inspection can occur during all modes: charging, discharging, and idle modes without an external power supply.

### 18 Claims, 15 Drawing Sheets



4 Patent Points

# **Easy-to-Remember Gmail** Address:

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### 589 Patents Issued

After 29 years of writing patents as a full-time Patent Agent, 589 applications that I've written have now issued as patents. Congratulations inventors!

You can view the 589 issued patents I've written at:

www.gpatent.com

### Rates Set for 2024

My hourly rate for 2024 will be \$430 per hour, billed in quarter-hour increments. Fixed-price quotes are available for patent applications to facilitate budgeting and avoid expensive surprises.

Prosecution work such as amendments and other paperwork is billed at the hourly rate. Litigation-support work is billed at a higher rate. Patent searches are billed at a flat \$800 for U.S. abstract searches. Patents can be viewed on-line.

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**Address Correction Requested**